DETF Recommendations I

2.1 Science (Charge questions 1, 2, 7)

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2.1.2 Comments

> II. We recommend that the dark energy program have multiple techniques at every stage, at least one of which is a probe sensitive to the growth of cosmological structure in the form of galaxies and clusters of galaxies.
>
> III. We recommend that the dark energy program include a combination of techniques from one or more Stage III projects designed to achieve, in combination, at least a factor of three gain over Stage II in the DETF figure of merit, based on critical appraisals of likely statistical and systematic uncertainties.

> Smaller, faster programs (Stage III[1]) are needed to provide the experience on which the long-term projects can build. These projects can reduce systematic uncertainties that could otherwise impede the larger projects, and at the same time make important advances in our knowledge of dark energy.

DETF Recommendations II

13. Six types of Stage-III projects have been considered. They include:
    a. a BAO survey on a 4-m class telescope using photo-*z*'s.
    b. a BAO survey on an 8-m class telescope employing spectroscopy.
    c. a CL survey on a 4-m class telescope obtaining optical photo-*z*'s for clusters detected in ground-based SZ surveys.
    d. a SN survey on a 4-m class telescope using photo-*z*'s.
    e. a SN survey on a 4-m class telescope employing spectroscopy from an 8-m class telescope.
    f. a WL survey on a 4-m class telescope using photo-*z*'s.

    These projects are typically projected by proponents to cost in the range of tens of millions of dollars. (Cost projections were not independently checked by the DETF.)

14. Our findings regarding Stage-III projects are
    a. Only an incremental increase in knowledge of dark-energy parameters is likely to result from a Stage-III BAO project using photo-*z*'s. The primary benefit from a Stage-III BAO photo-*z* project would be in exploring systematic photo-*z* uncertainties.
    b. A modest increase in knowledge of dark-energy parameters is likely to result from a Stage-III SN project using photo-*z*'s. Such a survey would be valuable if it were to establish the viability of photometric determination of supernova redshifts, types, and evolutionary effects.
    c. A modest increase in knowledge of dark-energy parameters is likely to result from any single Stage-III CL, WL, spectroscopic BAO, or spectroscopic SN survey.
    d. The SN, CL, or WL techniques could, individually, produce factor of two improvements in the DETF figure of merit, if the systematic errors are close to what the proponents claim.
    e. If executed in combination, Stage-III projects would increase the DETF figure of merit by a factor in the range of approximately three to five, with

Comments

2.1 Science (charge questions 1,2,7)

2.1.2 Comments

The DES is an ambitious project that will provide significant scientific results on all four of the science projects recommended by the Dark Energy Task Force: supernovae, clusters of galaxies, baryon acoustic oscillations, and weak lensing. The science proposed clearly fits in the Stage III project envisioned by the DETF (both members of this SC subcommittee were members of the DETF), both in terms of science goals and exploring systematic errors that will affect the Stage IV experiments. They have demonstrated that the DES meets the minimum factor of 3 recommended by the DETF

The DES has been conservative in drawing up science requirements in order to match technical constraints, including matching the science to what the telescope can deliver. In other words, there are no large looming technical requirements which could compromise the science goals. Careful attention has been paid to understanding the systematic errors in the data, and designing the experiment to either make these effects irrelevant or controllable by the experimental technique. *However, there are significant details that have been only partially explored in data reduction, calibration, and science analysis. None of these details will seriously affect the success of the project, if they are attended to.*

Comments

2.1 Science (con't)

2.1.2 Comments

What are the unique features of the science? The DES will work on all four science projects with one telescope. They have the ability to combine all the heterogeneous data into a single cosmological fit.

Uniqueness: VISTA, simultaneous reductions across all four experiments, cost effectiveness by using a single telescope, access to the southern sky surveyed by SPT, public access to data, wide field survey.

Who are the competitors? The DES should actively review the other projects to re-evaluate their goals and timetables to those goals. *The DES maintains a healthy advantage in getting the science done, provided that the funding does not slip.*

BAO: BOSS, HETDEX, WiggleZ

SN: PanStarrs, SNLS

WL: CFHT, …

Clusters: PISCO

Comments

2.1 Science (con't)

2.1.2 Comments

Access to the US community is very important. There is presently no resolution to how the project will protect itself (if it can) from similar science projects from the community using the same camera.

There were a few problems between the linkage between the science goals and the calibrations. No clear roadmap on how the science will be divided among the groups. Addition of VISTA time is a very good improvement.

The supernova survey science goals were not as well developed as the other science goals. A uniqueness of the supernova project is a deep and wide survey in the southern hemisphere, which will complement the Pan-STARRS survey which will allow all sky studies of the variation in w over large scales. Since this is a relative measurement, most of the systematic errors will be minimized.

A goal of 2% (rms) relative photometry will seriously affect the supernova science. An optimistic goal of 1% (rms) relative photometry should be a best effort goal with 2% as the minimun accuracy.

Recommendations

2.1 Science (con't)

2.1.3 Recommendations

1. **Explore a program to improve Blanco telescope image quality from 0.9" to 0.7" Evaluate such a program in terms of incremental cost to the project, incremental science gains, and the possibility of real improvement in the image quality.**
2. **Convene an NSF, NOAO, and DOE common users advisory group to recommend the US user's community needs for the use of DECam.**
3. **Resolve science overlap between DES science goals and user community science goals in the case where the user community proposes for time on DECam to do the DES science.**
4. **Actively review progress of competitors to maintain timeline towards scientific goals.**
5. **Determine the uniqueness of the science beyond achieving the factor of 3 goal of Stage III experiments.**
6. **Consider making the goal of 1% relative photometry as best effort goal with 2% minimum goal.**

Recommendations

2.1 Science (con't)

2.1.3 Recommendations

7. **Review and expand the goals of the supernova science component. Consider varying the cadence of data in the wide field survey to maximize sensitivity to SN science.**

8. **Organize a coordinated theory group across all the science projects.**